Referee report for "Does Special Relativity Theory Tell Us Anything New About Space and Time?"

Recommendation: Reject.

This is a paper in the tradition of neo-Lorentzian interpretations of special relativity. The basic idea of the paper is very simple, despite the cumbersome formalism trotted out by the author to make his point. One can--without compromising the empirical adequacy of the theory—maintain that, behind the Minkowski geometry read off of measuring rods and clocks governed by Lorentz invariant laws and synchronized according to (something equivalent to) the Poincaré-Einstein synchronization convention, there is still the old familiar Newtonian space-time with its unique split into space and time and its, from a space-time point of view, degenerate temporal metric (i.e., the time lapse between two events is completely independent of the path between them). The author points out that special relativity doesn't replace Newtonian space-time by Minkowski space-time but essentially retains Newtonian space-time and just arbitrarily bestows the name "space-time" on the Minkowski space-time "naively" revealed by our clocks and rods. Once a preferred Lorentz frame on Minkowski space-time is adopted and identified with a Galilean frame on Newtonian space-time, all measurements in other frames can be corrected for the distortions of the measuring apparatus (length contraction and time dilation) and, one should add, the faulty clock synchronization, and these measurements can then be seen as revealing the "true" Newtonian geometry after all. This is all there is to this paper.

The response to the author's position is simple. As Poincaré pointed out in his discussion of the conventionality of geometry, one can of course hold on to any geometry (or space-time kinematics) provided one is willing to make the proper adjustments to the dynamics. Hence, if one so desires, one can hold on to Newtonian space-time and blame the deviations from it as measured by rods and clocks on dynamical effects distorting the rods and clocks (as well as on synchronization conventions). As the author reiterates, and has also been pointed out by Bell, this approach has one didactic advantage: it makes it clear that length contraction and time dilation are real effects and not, as some ancient relativity texts suggest, artifacts of measurement.

But this does not take away that one would have to have very good arguments indeed for proposing that a world governed by Lorentz invariant laws has anything other than a Minkowski space-time structure. (Bell of course thought that EPR correlations provided such a reason but even those arguments were ever compelling recent progress in the interpretation of quantum mechanics has made them obsolete.) The pedagogical advantage of rectifying misguided statements by earlier relativists hardly provides such an argument. Two wrongs don't make a right. Reasonable people can of course differ over the ontological status of the Minkowski space-time structure (relational, substantival, or something in between). What is much more difficult to disagree about is that the structure of space-time in a regime governed by Lorentz invariant laws is Minkowskian and not Newtonian. The author suppresses some basic facts to obscure this point. He never mentions that the systems K and K' he uses are completely interchangeable. It is only by fiat that K rather than K' is chosen as the standard for measurement in all other systems (in the sense that observers in K' have to correct their measurements according to the standards of K rather than the other way around).

The author makes his point using unnecessary cumbersome formalism. To see this, take a look at pp. 3-4. There the author introduces various space and time coordinates of an event A. He considers two frames of reference, K and K', in motion with respect to one another.
And he considers coordinates with and without a tilde to distinguish "classical" from relativistic coordinates. There are thus four sets of coordinates (I'll use upper case letters instead of tildes):

$x^{K}(A)$, $t^{K}(A)$.
$x^{K'}(A)$, $t^{K'}(A)$

$X^{K}(A)$, $T^{K}(A)$
$X^{K'}(A)$, $T^{K'}(A)$

It takes the author almost two pages to introduce these quantities. In K, (x,t) and (X,T) coincide. In K', they obviously do not. In terms of (x,t), K and K' are related by a Galilean transformation. In terms of (X,T), K and K' are related by a Lorentz transformation. The author goes through a tedious calculation involving slow clock transport to make the completely non-contentious point that in K', (x,t) of A differ from (X,T) of A. The author's calculation adds nothing to the qualitative summary of his point that I gave above. In fact, because it is so tedious, it only produces a smoke screen, making it more difficult to see what the point really is.
There is no reason to subject your readers to the same unrewarding exercise as this referee of going through this authors algebra only to find out that it serves no purpose beyond a smoke screen for an otherwise trivial point.